

# **Field Report for Airborne Data Collected In Support of US EPA Region VI Tri-Chem Industries Fire 15 March 2018**

## **Background**

On 15 March 2018 a reported explosion and fire developed at the Tri-Chem Industries facility located 4.5 kilometers North West of Cresson, TX. Local news organizations reported heavy black smoke with periodic explosions. A number of fire companies were deployed from Fort Worth. The facility reported through Tier II reports to have a number of organic and inorganic compounds including acetic acid, aqua ammonia, dipropylene glycol methyl ether, and phosphoric acid. The US EPA Region VI requested that the ASPECT system be deployed to support ongoing activities at the site at approximately 1200 (local) on 15 March 2018. ASPECT was formally notified to launch at 1210 and was airborne at 1305. Since the fire was within the metro-plex area, flight time to the target was estimated at 25 (arrival at 1330) minutes.

The Tri-Chem facility is located 4.5 kilometers north of Cresson, TX on Cresson Highway. The geographical coordinates of the facility are 32.5520N, 97.6591W (figure 1). The area is a very flat with the town of Cresson being the only nearby residential area.



Figure 1: Tri-Chem Industries, Cresson, TX

**ASPECT response to this Mission/Incident was in support of:**

US EPA Region 6. OSC: Adam Adams

**ASPECT System**

The US EPA ASPECT system collects airborne infrared (IR) images and chemical screening data from a safe distance over the site (about 3,000 ft AGL). The system consists of an airborne high speed Fourier transform infrared spectrometer (FTIR) coupled with a wide-area IR line scanner (IRLS). The ASPECT IR systems have the ability to detect compounds in both the 8 to 12 micron (800 to 1200 cm<sup>-1</sup>) and 3 to 5 micron (2000 to 3200 cm<sup>-1</sup>) regions. The 8 to 12 micron region is typically known as the atmospheric window region since the band is reasonably void of water and carbon dioxide influence. Spectrally, this region is used to detect carbon - non-carbon bonded compounds. The 3 to 5 micron region is also free of water and carbon dioxide but typically does not have sufficient energy for use. This band does show use in high-energy environments such as fires. The carbon - hydrogen stretch is very common in this region.

A digital Nikon DX2 camera (12.4 mega pixel CMOS 3:5 aspect ratio, 28 mm wide-angle lens) collects visible aerial imagery as part of the core data product package. The camera timing system is connected to the primary IR sensors and provides concurrent image collection when other sensors are triggered. All imagery is geo-rectified using both aircraft attitude correction (pitch, yaw, and roll) and GPS positional information. Imagery can be processed while in flight or approximately 600 frames per hour can be processed once the data are downloaded from the aircraft.

An Imperx mapping camera (29 mega pixels; mapping focal plane array) provides a similar aspect ratio and aerial coverage. Like the Nikon DX2, it is connected to the primary IR sensors and provides concurrent image collection when other sensors are triggered. These images are often digitally processed in lower resolution so they can be transmitted via satellite communication. The high resolution images (>20 MB each) are pulled from the ASPECT after the sortie and are available at a later time.

All aerial photographic images collected by the ASPECT system are ortho-rectified and geospatially validated by the reachback team. In general, this consists of conducting geo-registration using a Digital Elevation Model (DEM) which promotes superior pixel computation and lessens topographic distortion. The image is then check by a team member (using a Google Earth base map) for proper location and rotation

Data is processed using automated algorithms onboard the aircraft with preliminary results being sent using a satellite system to the ASPECT reachback team for QA/QC analysis. Upon landing preliminary data results are examined and validated by the reachback team.

ASPECT data provides complete GIS compatibility with a number of systems including Google Earth and ESRI ArcView. For this response, data is being provided in a Google Earth format

with uses a KML format file. The KML n-link file is a collection of Google Earth KML scripts that permits full viewing and download of data associated with a given deployment or project. Once the n-link has been loaded on your computer, subsequent installs of the link are unnecessary for the duration of the project or deployment; as new data is added to the project, the n-link, when opened will show the new data in chronological order. Two software packages are necessary to run the n-link. You will need an installed copy of Google Earth and a current copy of your favorite internet browser (Internet Explorer, Chrome, or Firefox) your internet browser.

## Weather Conditions and Crew Report

Weather conditions for the Cresson area at the time of data collection consisted of clear skies with about 16 km (10 miles) of visibility. Winds were from the south at 5 m/sec (20 mph). The surface temperature was 22°C with a humidity of 42%. Pressure was reported as 1012 mb. Winds at altitude were reported to be about 22 kts from the south. The crew reported very little smoke with a faint smoke plume moving to the north suggesting that the fire about to burn out.

## Flight Status

The order to launch the aircraft was given 1305 local on 15 March 2018 and the aircraft was on station at 1330. The aircraft made a total of 15 data collection passes; flight information is summarized in Appendix A and Figure 2.

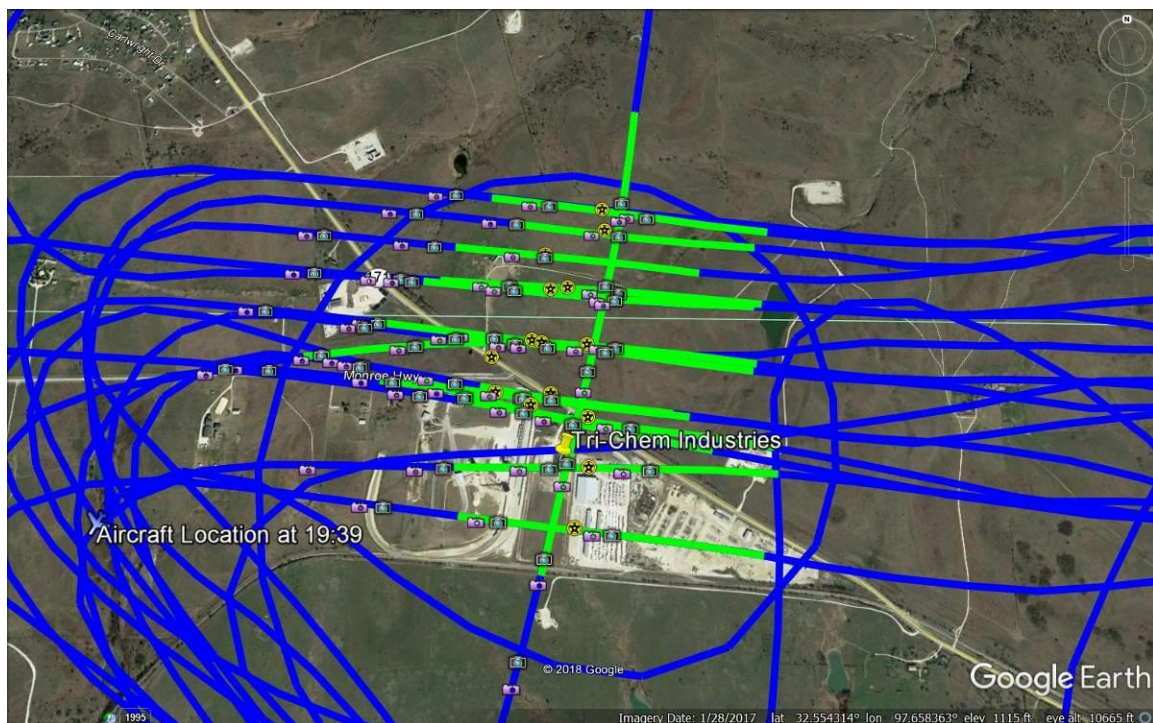


Figure 2: Data collection passes, Tri-Chem Industries, Cresson, TX



## Data Results

### Line Scanner Data Results

A total of 1 test and 15 data passes were made in the proximity of the site and an infrared line scanner image were generated for each pass. Figure 3 shows a typical 3-band image obtained from data collected in run 15. Objects that are hot will appear white while cold images will appear black. The white shades of the structure indicate that this area of the image is hot; consistent with a fire. No plume was observed in any of the data collection passes.



Figure 3: – 3 band IR image, Run 15, Tri-Chem Industries

### FTIR Data Results

FTIR Spectral data was collected for each pass at a resolution of 16 wavenumbers. ASPECT uses an automated detection algorithm to permit compounds to be analyzed while the aircraft is in flight. 78 compounds are included in this algorithm and the list and associated detection limits are given in Table 1. In addition, collected data are also manually analyzed by comparing any detected spectral signatures to a collection of published library spectra.

Organic compounds including 1-butene, 2-butene and isobutylene were observed in three data passes with the locations given in Figure 4. These compounds are common products of combustion. On data pass 3 an isolated and low level detection of 1-butene was made north of the facility (downwind) and across the highway. On pass 15 and 16 the system was flown approximately 50 meters downwind of the facility building. These passes showed several compounds including 1-butene, 2-butene, isobutylene and a very low concentration of allyl alcohol; all below 2 ppm. Additional compounds were also detected and included ozone and peroxyacyl nitrates (PAN) being generated by the hot fire. Post analysis of data showed a low presence of acetone with a maximum concentration of 0.7 ppm. A summary of the chemical detections is given in Table 2. A typical example of confirmation spectra is given in Figure 5. This image shows isobutylene characteristic of the major peak located at 890 wavenumbers.

**TABLE 1 – Chemicals Included in the ASPECT Auto-Processing Library**

Acetic Acid	Cumene	Isoprene	Propylene
Acetone	Diborane	Isopropanol	Propylene Oxide
Acrolein	1,1-Dichloroethene	Isopropyl Acetate	Silicon Tetrafluoride
Acrylonitrile	Dichloromethane	MAPP	Sulfur Dioxide
Acrylic Acid	Dichlorodifluoromethane	Methyl Acetate	Sulfur Hexafluoride
Allyl Alcohol	Difluoroethane	Methyl Ethyl Ketone	Sulfur Mustard
Ammonia	Difluoromethane	Methanol	Nitrogen Mustard
Arsine	Ethanol	Methylbromide	Phosgene
Bis-Chloroethyl Ether	Ethyl Acetate	Methylene Chloride	Phosphine
Boron Tribromide	Ethyl Formate	Methyl Methacrylate	Tetrachloroethylene
Boron Trifluoride	Ethylene	MTEB	1,1,1-Trichloroethane
1,3-Butadiene	Formic Acid	Naphthalene	Trichloroethylene
1-Butene	Freon 134a	n-Butyl Acetate	Trichloromethane
2-Butene	GA (Tabun)	n-Butyl Alcohol	Triethylamine
Carbon Tetrachloride	GB (Sarin)	Nitric Acid	Triethylphosphate
Carbonyl Chloride	Germane	Nitrogen Trifluoride	Trimethylamine
Carbon Tetrafluoride	Hexafluoroacetone	Phosphorus Oxychloride	Trimethyl Phosphite
Chlorodifluoromethane	Isobutylene	Propyl Acetate	Vinyl Acetate

A comparison of the detected compounds and those listed on the Tier II report for the facility tends to show consistency. The allyl alcohol detected is characteristic of a heavy alcohol with a number of peaks from 900 to 1200 wavenumber. The report shows that 2(2-butoxyethoxy) ethanol is stored on-site and has an IR signature similar to that of allyl alcohol, namely a wide signature centered around 1100 wavenumber. Also, diacetone alcohol has IR spectra showing the characteristic peaks of acetone between 1050 and 1300 wavenumbers.



Figure 4: Chemical Detection Locations, Tri-Chem Industries

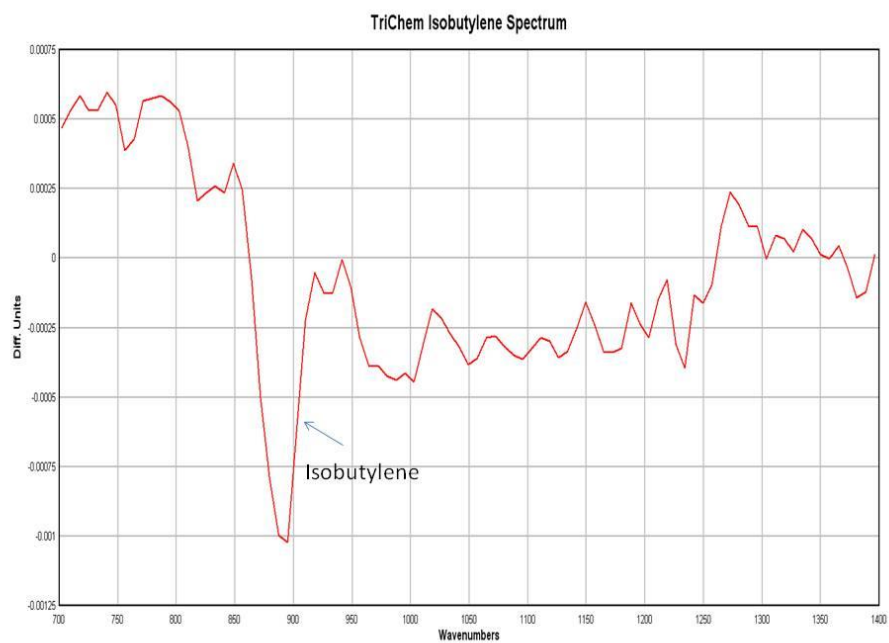


Figure 5: Isobutylene Spectra, Tri-Chem Industries

**Table 2. Chemical Results Summary**

Run	Date	Time (UTC)	Chemical	Max Concentration (ppm)
1	15 March 2018	1818	Test	Test
2		1832	None	None
3		1835	1-butene	1.296
4		1838	None	None
5		1842	None	None
6		1848	None	None
7		1855	None	None
8		1902	None	None
9		1906	None	None
10		1909	None	None
11		1913	None	None
12		1917	None	None
13		1925	None	None
14		1931	None	None
15		1934	2-butene	2.805
	isobutylene		1.898	
	Allyl alcohol		0.718	
16	1938	1-butene	1.655	
		2-butene	1.967	
		Acetone	0.390	

### Aerial Photography Results

A full set of high resolution aerial digital photography was collected as part of the flight. Figure 6 shows a representative image collected as part of Run 5. This image has been orthorectified with the top of the image being north. The facility which is located in the center of the frame clearly shows damage to the roof. Close examination shows the presence of a very light plume moving to the north. Figure 7 shows a typical oblique image collected from the right side of the aircraft. This image is not geo-rectified. The top of the image is looking to the east. Examination of the image clearly shows the extent of collapse of the roof with a small amount of smoke being emitted on the southern part of the building.

### Conclusions

ASPECT was dispatched at the request of the EPA Region VI emergency response program to provide air monitoring of the Tri-Chem Industries fire. ASPECT arrived on-site at 1330 (local) and noted a light colored plume moving toward the north. Initial data passes north of the facility (downwind) showed an isolated detection of 1-butene northwest of the facility. On pass 15 and 16 the system was flown so a close ground track passes immediately north of the facility. These passes showed several compounds including 1-butene, 2-butene, and isobutylene;

all below 2 ppm. Very low levels of acetone (less than 1 ppm) were also detected immediately downwind of the facility. IR imagery collected over the site clearly showed the elevated temperature of the structure but did not show any emission being generated by the facility.





Figure 6: Aerial image Tri-Chem Industries



Figure 7: Oblique Image Tri-Chem Industries.

## Appendix A.

### Mission Log

Mission: 2018-03-15 Tri Chemicals

Date: 3/15/2018

Time UTC: 18:18

Aircraft Number: N9738B

DEM: Using elevation from DEM Database

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Run: 1 Time: 18:22:02 UTC

Alt: 3572 ft MSL Elev: 785 ft Elevation from DEM Database

Vel: 145 knots Heading: 244

Digitals: 5

24mm2018\_03\_15\_18\_21\_34.jpg

24mm2018\_03\_15\_18\_21\_40.jpg

24mm2018\_03\_15\_18\_21\_47.jpg

24mm2018\_03\_15\_18\_21\_53.jpg

24mm2018\_03\_15\_18\_21\_59.jpg

MSIC: 5

20180315182214277.jpg

20180315182220627.jpg

20180315182226991.jpg

20180315182233341.jpg

20180315182239706.jpg

FTIR: 1

20180315\_182206\_A.igm

IRLS: 1

2018\_03\_15\_18\_22\_07\_R\_01 TA=14.9;TB=34.7;Gain=3

Gamma Runs: None

---

Run: 2 Time: 18:32:14 UTC

Alt: 3904 ft MSL Elev: 1109 ft Elevation from DEM Database

Vel: 102 knots Heading: 265

Digitals: 3

24mm2018\_03\_15\_18\_31\_47.jpg

24mm2018\_03\_15\_18\_31\_53.jpg

24mm2018\_03\_15\_18\_31\_59.jpg

MSIC: 3

20180315183227109.jpg

20180315183233474.jpg

20180315183238918.jpg

FTIR: 1

20180315\_183218\_A.igm

IRLS: None

Gamma Runs: None

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Run: 3 Time: 18:35:08 UTC

Alt: 3927 ft MSL Elev: 1105 ft Elevation from DEM Database

Vel: 106 knots Heading: 257

Digitals: 5

24mm2018\_03\_15\_18\_34\_41.jpg

24mm2018\_03\_15\_18\_34\_47.jpg

24mm2018\_03\_15\_18\_34\_53.jpg

24mm2018\_03\_15\_18\_35\_00.jpg

24mm2018\_03\_15\_18\_35\_06.jpg

MSIC: 5

20180315183520532.jpg

20180315183526881.jpg

20180315183533230.jpg

20180315183539595.jpg

20180315183545944.jpg

FTIR: 1

20180315\_183512\_A.igm

IRLS: 1

2018\_03\_15\_18\_35\_14\_R\_03 TA=15.0;TB=35.0;Gain=3

Gamma Runs: None

-----

Run: 4 Time: 18:38:43 UTC

Alt: 4027 ft MSL Elev: 1087 ft Elevation from DEM Database

Vel: 117 knots Heading: 260

Digitals: 3

24mm2018\_03\_15\_18\_38\_15.jpg

24mm2018\_03\_15\_18\_38\_22.jpg

24mm2018\_03\_15\_18\_38\_28.jpg

MSIC: 3

20180315183855697.jpg

20180315183902062.jpg

20180315183908412.jpg

FTIR: 1

20180315\_183846\_A.igm

IRLS: None

Gamma Runs: None

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Run: 5 Time: 18:42:20 UTC

Alt: 4019 ft MSL Elev: 1098 ft Elevation from DEM Database

Vel: 99 knots Heading: 191

Digitals: 6

24mm2018\_03\_15\_18\_41\_52.jpg

24mm2018\_03\_15\_18\_41\_58.jpg

24mm2018\_03\_15\_18\_42\_04.jpg

24mm2018\_03\_15\_18\_42\_11.jpg

24mm2018\_03\_15\_18\_42\_17.jpg

24mm2018\_03\_15\_18\_42\_23.jpg

MSIC: 6

20180315184231784.jpg

20180315184238133.jpg

20180315184244498.jpg

20180315184250847.jpg

20180315184257196.jpg

20180315184303561.jpg

FTIR: 1

20180315\_184224\_A.igm

IRLS: 1

2018\_03\_15\_18\_42\_25\_R\_05 TA=15.0;TB=35.0;Gain=3

Gamma Runs: None

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Run: 6 Time: 18:48:26 UTC

Alt: 4021 ft MSL Elev: 1104 ft Elevation from DEM Database

Vel: 115 knots Heading: 266

Digitals: 3

24mm2018\_03\_15\_18\_47\_58.jpg

24mm2018\_03\_15\_18\_48\_04.jpg

24mm2018\_03\_15\_18\_48\_10.jpg

MSIC: 3

20180315184837671.jpg

20180315184844020.jpg

20180315184850385.jpg

FTIR: 1

20180315\_184829\_A.igm

IRLS: None

Gamma Runs: None

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Run: 7 Time: 18:55:56 UTC

Alt: 4089 ft MSL Elev: 1112 ft Elevation from DEM Database

Vel: 133 knots Heading: 264

Digitals: 3

24mm2018\_03\_15\_18\_55\_28.jpg

24mm2018\_03\_15\_18\_55\_35.jpg

24mm2018\_03\_15\_18\_55\_41.jpg

MSIC: 3

20180315185608905.jpg

20180315185615254.jpg

20180315185621619.jpg

FTIR: 1

20180315\_185600\_A.igm

IRLS: None

Gamma Runs: None

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Run: 8 Time: 19:02:37 UTC

Alt: 3924 ft MSL Elev: 1104 ft Elevation from DEM Database

Vel: 122 knots Heading: 263

Digitals: 4

24mm2018\_03\_15\_19\_02\_09.jpg

24mm2018\_03\_15\_19\_02\_15.jpg

24mm2018\_03\_15\_19\_02\_21.jpg

24mm2018\_03\_15\_19\_02\_28.jpg

MSIC: 4

20180315190249286.jpg

20180315190255635.jpg

20180315190301095.jpg

20180315190307444.jpg

FTIR: 1

20180315\_190240\_A.igm

IRLS: 1

2018\_03\_15\_19\_02\_42\_R\_08 TA=15.0;TB=35.0;Gain=3

Gamma Runs: None

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Run: 9 Time: 19:06:02 UTC

Alt: 3702 ft MSL Elev: 1103 ft Elevation from DEM Database

Vel: 99 knots Heading: 260

Digitals: 3

24mm2018\_03\_15\_19\_05\_35.jpg

24mm2018\_03\_15\_19\_05\_41.jpg

24mm2018\_03\_15\_19\_05\_47.jpg

MSIC: 3

20180315190615387.jpg

20180315190620832.jpg

20180315190627181.jpg

FTIR: 1

20180315\_190606\_A.igm

IRLS: None

Gamma Runs: None

---

Run: 10 Time: 19:09:36 UTC

Alt: 3868 ft MSL Elev: 1094 ft Elevation from DEM Database

Vel: 110 knots Heading: 261

Digitals: 4

24mm2018\_03\_15\_19\_09\_08.jpg

24mm2018\_03\_15\_19\_09\_14.jpg

24mm2018\_03\_15\_19\_09\_20.jpg

24mm2018\_03\_15\_19\_09\_27.jpg

MSIC: 4

20180315190947827.jpg

20180315190954192.jpg

20180315191000541.jpg

20180315191006890.jpg

FTIR: 1

20180315\_190940\_A.igm

IRLS: 1

2018\_03\_15\_19\_09\_41\_R\_10 TA=15.0;TB=35.0;Gain=3

Gamma Runs: None

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Run: 11 Time: 19:13:37 UTC

Alt: 3882 ft MSL Elev: 1093 ft Elevation from DEM Database

Vel: 122 knots Heading: 262

Digitals: 3

24mm2018\_03\_15\_19\_13\_09.jpg

24mm2018\_03\_15\_19\_13\_15.jpg

24mm2018\_03\_15\_19\_13\_21.jpg

MSIC: 3

20180315191349327.jpg

20180315191355692.jpg

20180315191401136.jpg

FTIR: 1

20180315\_191340\_A.igm

IRLS: 1

2018\_03\_15\_19\_13\_42\_R\_11 TA=15.0;TB=35.0;Gain=3

Gamma Runs: None

---

Run: 12 Time: 19:17:29 UTC

Alt: 3828 ft MSL Elev: 1080 ft Elevation from DEM Database

Vel: 112 knots Heading: 264

Digitals: 3

24mm2018\_03\_15\_19\_17\_01.jpg

24mm2018\_03\_15\_19\_17\_08.jpg

24mm2018\_03\_15\_19\_17\_14.jpg

MSIC: 3

20180315191741763.jpg

20180315191748113.jpg

20180315191754462.jpg

FTIR: 1

20180315\_191733\_A.igm

IRLS: None

Gamma Runs: None

-----

Run: 13 Time: 19:25:34 UTC

Alt: 3874 ft MSL Elev: 1071 ft Elevation from DEM Database

Vel: 106 knots Heading: 263

Digitals: 2

24mm2018\_03\_15\_19\_25\_06.jpg

24mm2018\_03\_15\_19\_25\_19.jpg

MSIC: 3

20180315192546581.jpg

20180315192552930.jpg

20180315192559296.jpg

FTIR: 1

20180315\_192538\_A.igm

IRLS: None

Gamma Runs: None

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Run: 14 Time: 19:31:02 UTC

Alt: 3911 ft MSL Elev: 1107 ft Elevation from DEM Database

Vel: 110 knots Heading: 264

Digital: 3

24mm2018\_03\_15\_19\_30\_34.jpg

24mm2018\_03\_15\_19\_30\_40.jpg

24mm2018\_03\_15\_19\_30\_47.jpg

MSIC: 3

20180315193114339.jpg

20180315193120688.jpg

20180315193127053.jpg

FTIR: 1

20180315\_193106\_A.igm

IRLS: None

Gamma Runs: None

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Run: 15 Time: 19:34:49 UTC

Alt: 3925 ft MSL Elev: 1110 ft Elevation from DEM Database

Vel: 116 knots Heading: 267

Digital: 3

24mm2018\_03\_15\_19\_34\_21.jpg

24mm2018\_03\_15\_19\_34\_27.jpg

24mm2018\_03\_15\_19\_34\_33.jpg

MSIC: 3

20180315193501317.jpg

20180315193507666.jpg

20180315193514015.jpg

FTIR: 1

20180315\_193453\_A.igm

IRLS: None

Gamma Runs: None

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Run: 16 Time: 19:38:31 UTC

Alt: 4062 ft MSL Elev: 1111 ft Elevation from DEM Database

Vel: 105 knots Heading: 257

Digitals: 4

24mm2018\_03\_15\_19\_38\_03.jpg

24mm2018\_03\_15\_19\_38\_09.jpg

24mm2018\_03\_15\_19\_38\_16.jpg

24mm2018\_03\_15\_19\_38\_22.jpg

MSIC: 4

20180315193843742.jpg

20180315193850107.jpg

20180315193856456.jpg

20180315193902821.jpg

FTIR: 1

20180315\_193834\_A.igm

IRLS: 1

2018\_03\_15\_19\_38\_36\_R\_16 TA=15.0;TB=35.0;Gain=3

Gamma Runs: None

## Appendix B

### Tabular Chemical Results

20180315\_183512\_A\_igm

1-butene

Estimated Detection Limit = 1.20 ppm

Scan	Latitude	Longitude	Concentration
			ppm

1227	32.555622	-97.662639	1.205
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1228	32.555620	-97.662698	1.296
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20180315\_193453\_A\_igm

2-butene

Estimated Detection Limit = 1.87 ppm

Scan	Latitude	Longitude	Concentration
			ppm

544	32.551679	-97.658588	2.089
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545	32.551677	-97.658588	2.664
-----	-----------	------------	-------

546	32.551673	-97.658587	2.447
-----	-----------	------------	-------

547	32.551670	-97.658586	2.757
-----	-----------	------------	-------

548	32.551668	-97.658585	2.450
-----	-----------	------------	-------

549	32.551665	-97.658584	2.206
-----	-----------	------------	-------

550	32.551662	-97.658583	2.437
-----	-----------	------------	-------

551	32.551660	-97.658581	2.473
-----	-----------	------------	-------

552	32.551658	-97.658580	2.609
-----	-----------	------------	-------

553	32.551655	-97.658578	2.650
-----	-----------	------------	-------

554	32.551653	-97.658576	2.279
-----	-----------	------------	-------

555	32.551651	-97.658575	2.380
-----	-----------	------------	-------

556	32.551657	-97.658619	2.351
-----	-----------	------------	-------

557	32.551671	-97.658698	2.689
-----	-----------	------------	-------

558	32.551668	-97.658697	2.805
-----	-----------	------------	-------

559	32.551666	-97.658695	2.755
-----	-----------	------------	-------

560	32.551664	-97.658693	2.352
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561	32.551663	-97.658691	2.156
-----	-----------	------------	-------

562	32.551661	-97.658690	2.181
-----	-----------	------------	-------

563	32.551658	-97.658688	2.099
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20180315\_193453\_A\_igm

allyl alcohol

Estimated Detection Limit = 0.53 ppm

Scan Latitude Longitude Concentration

			ppm
547	32.551670	-97.658586	0.635
548	32.551668	-97.658585	0.654
549	32.551665	-97.658584	0.607
550	32.551662	-97.658583	0.620
551	32.551660	-97.658581	0.718
552	32.551658	-97.658580	0.676
553	32.551655	-97.658578	0.624
554	32.551653	-97.658576	0.573
555	32.551651	-97.658575	0.545
556	32.551657	-97.658619	0.543
558	32.551668	-97.658697	0.563
559	32.551666	-97.658695	0.600
<u>560</u>	<u>32.551664</u>	<u>-97.658693</u>	<u>0.589</u>

20180315\_193453\_A\_igm

isobutylene

Estimated Detection Limit = 1.50 ppm

Scan Latitude Longitude Concentration

			ppm
559	32.551666	-97.658695	1.650
560	32.551664	-97.658693	1.634
561	32.551663	-97.658691	1.640
562	32.551661	-97.658690	1.785
563	32.551658	-97.658688	1.886
564	32.551656	-97.658686	1.839
565	32.551653	-97.658685	1.898
566	32.551649	-97.658684	1.799
567	32.551646	-97.658683	1.896
568	32.551643	-97.658681	1.805
569	32.551640	-97.658680	1.755
570	32.551637	-97.658679	1.618
<u>571</u>	<u>32.551636</u>	<u>-97.658690</u>	<u>1.515</u>

20180315\_193834\_A\_igm

1-butene

Estimated Detection Limit = 1.20 ppm

Scan Latitude Longitude Concentration

ppm

875	32.551226	-97.658921	1.212
876	32.551216	-97.658918	1.255
877	32.551204	-97.658914	1.288
878	32.551195	-97.658911	1.335
879	32.551186	-97.658909	1.376
880	32.551177	-97.658906	1.392
881	32.551168	-97.658903	1.412
882	32.551160	-97.658900	1.433
883	32.551153	-97.658897	1.440
884	32.551146	-97.658895	1.417
885	32.551139	-97.658907	1.451
886	32.551134	-97.658979	1.481
887	32.551129	-97.659003	1.497
889	32.551120	-97.658999	1.514
890	32.551117	-97.658997	1.564
891	32.551113	-97.658995	1.618
892	32.551111	-97.658993	1.614
893	32.551108	-97.658991	1.696
894	32.551106	-97.658989	1.645
895	32.551105	-97.658988	1.644
896	32.551104	-97.658986	1.655
897	32.551103	-97.658985	1.654
898	32.551103	-97.658984	1.604
899	32.551103	-97.658983	1.528
900	32.551102	-97.658982	1.410
901	32.551102	-97.659037	1.365

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2-butene

Estimated Detection Limit = 1.87 ppm

Scan Latitude Longitude Concentration

ppm

879	32.551186	-97.658909	1.996
892	32.551111	-97.658993	1.902
893	32.551108	-97.658991	1.930
894	32.551106	-97.658989	1.967

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acetone

Estimated Detection Limit = 0.20 ppm

Scan Latitude Longitude Concentration

			ppm
879	32.551186	-97.658909	0.226
883	32.551153	-97.658897	0.207
884	32.551146	-97.658895	0.217
885	32.551139	-97.658907	0.247
886	32.551134	-97.658979	0.203
889	32.551120	-97.658999	0.215
890	32.551117	-97.658997	0.225
891	32.551113	-97.658995	0.248
892	32.551111	-97.658993	0.271
893	32.551108	-97.658991	0.322
894	32.551106	-97.658989	0.335
895	32.551105	-97.658988	0.371
896	32.551104	-97.658986	0.390
897	32.551103	-97.658985	0.361
898	32.551103	-97.658984	0.283
899	32.551103	-97.658983	0.253